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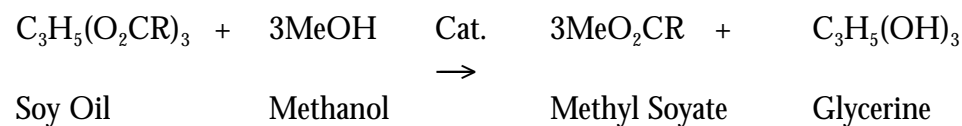
Soy Methyl Ester Solvents Technical Background

Since the enactment of the Clean Air Act of 1990, many conventional chlorinated, fluorocarbon and petroleum industrial solvents have been regulated out of traditional market applications. Methyl soyate, a soybean-oil-based methyl ester, is gaining market acceptance as an excellent solvent replacement alternative in applications such as parts cleaning and degreasing, paint and ink removal, and oil spill remediation. It is also being marketed in numerous formulated consumer products including hand cleaners, car waxes and graffiti removers. Research funded by the United Soybean Board has focused on the technical and regulatory aspects of methyl.

Methyl soyate production and use

Methyl soyate is a soy methyl ester produced by the transesterification of soybean oil with methanol. It is commercially available from numerous manufacturers and suppliers.

As a solvent, methyl soyate has important environmental- and safety-related properties that make it attractive for many industrial applications. It is lower in toxicity than most other solvents, is readily biodegradable, and has a very high flash point and a low level of volatile organic compounds (VOCs). The compatibility of methyl soyate is excellent with metals, plastics, most elastomers and other organic solvents.



Physical properties

Methyl soyate is a nearly colorless liquid with low water solubility. It is safer to use than most other solvents because it has a high flash point (>360°F).

Its oral toxicity is lower than many common substances, and it is a non-irritant to eyes or skin. Methyl soyate is low in VOCs, <50 g/liter; it is not listed as a Hazardous Air Pollutant (HAP) or an Ozone Depleting Chemical (ODC).

Biodegradability testing by an independent laboratory determined that 95 percent of methyl soyate samples biodegraded in 28 days.

Physical Properties of Methyl Soyate

Property	Value	Reference
Kauri-butanol value	58	ASTM D 1133
VOCs	<50 g/mL ¹	EPA Method 24; ASTM D 3960
Flash point	>360° F	ASTM D 455
Specific gravity	0.88	ASTM D 1475
Density	7.3 lb./gal.	ASTM D 1298
Vapor pressure	<0.1 mm Hg	ASTM D 5191
Evaporation rate	0.0098	ASTM D 3539
Boiling point	>400° F	ASTM D 2887
LD ₅₀	17.4 g/kg	



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Solvent properties

The cleaning performance of methyl soyate when tested against other commercial alternative solvents such as aliphatic hydrocarbons, NMP*, DBE-2*, d-Limonene and DPNB* was equivalent to that of most common oils and greases.² Elevated temperatures, agitation and co-solvent formulating can enhance methyl soyate's cleaning and rinsability and accelerate evaporation, which is characteristically slow.

The Kauri-butanol (KB) value for methyl soyate compares very favorably with other commercial solvents. KB value is a relative measure of solvency. Typical VOC levels for methyl soyate are much lower than other common solvents and the flammability potential is low, with a flash point much greater than many other organic solutions.

Product	KB Value	Comparative % VOCs	Flash point °F
Methyl soyate	58	33	>360
Mineral spirits	35	100	107
Toluene	105	100	41
Naphtha	35	100	58
d-Limonene	56	95	121

Current Uses


- Printing ink press cleaners
- Adhesive removers
- Paint strippers
- Oil spill cleanup and bioremediation
- Parts cleaners
- Hand cleaners
- Graffiti removers
- Metalworking fluids
- Pesticide adjuvants
- Mold and form release agents (concrete and asphalt)
- Corrosion preventives
- Auto waxes
- Biodiesel fuels and additives
- Personal care products
- Household cleaners
- Screen printing ink cleaners

* N-methyl pyrrolidone

Dibasic Ester-2

Glycol Ether DPnB

USB/01/01-98

The United Soybean Board is composed of 62 U.S. soybean farmers appointed by the Secretary of Agriculture to invest soybean checkoff funds. The soybean checkoff is a farmer-supported marketing and research fund collected on each bushel of U.S. soybeans sold. USB invests these funds on behalf of the 600,000 U.S. soybean farmers in activities specifically designed to increase the global utilization of U.S. soybeans and to reduce production costs. Checkoff-funded investment areas include human and animal health and nutrition, research and development of new uses, and research to improve soybean composition and production efficiencies. 

Notes:

1 VOC testing by DL Laboratories, NY, NY, 1999, determined VOC levels of four methyl soyate samples to be between 18 and 40 gm/l.

2 Farella, J., Physical and Cleaning Performance Properties of Methyl Soyate, Philip Services Corp., Midland, MI, 1997.